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(71) Applicant: **UNEX CORPORATION**
120 Wesley Street
South Hackensack New Jersey 07606(US)

(72) Inventor: **Junkers, John K.**
7 Arrowhead Lane
Saddle River New Jersey 07458(US)
Inventor: **Krautter, Wilhelm F.**
Portland 18357
Pennsylvania(US)

(74) Representative: **Patentanwaltsbüro Cohausz & Florack**
Postfach 14 01 20
D-4000 Düsseldorf 1(DE)

(54) Torque Wrench.

(57) A torque tool for tightening and loosening a threaded connector having at least first (13) and second (14) threaded parts turnably connected with one another, comprises a power unit (2), a first engaging unit (4) arranged to engage first part (13) of a threaded connector, a second engaging unit arranged to engage the second part (14) of a threaded connector, the engaging units being formed so that when power is applied by the power unit, one of the engaging unit turns one part of a threaded connector, while the other of the engaging units cooperates with the other part of a threaded connector, thus permitting tightening or loosening a threaded connector

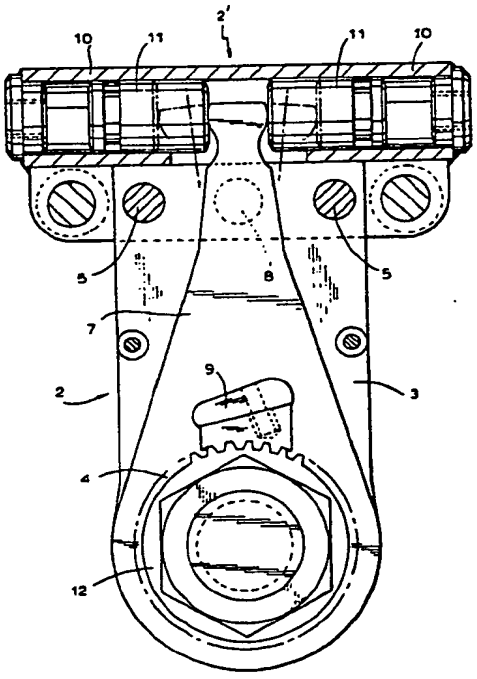

FIG. 1

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BACKGROUND OF THE INVENTION

The present invention relates to a torque wrench for applying or releasing a load on a threaded connectors during its tightening and loosening.

Torque wrenches of the above mentioned general type for threaded connectors such as nuts, bolts, etc., are known in the art. A known torque wrench includes fluid operated means arranged in a housing of the wrench, drive means actuatable by the fluid operate means, and engaging means which is driven by the drive means and engage a threaded connector for tightening and loosening the same. During tightening or loosening a threaded connector, a reaction force is produced which tends to move a housing of the wrench in an opposite direction. It is known to provide a torque wrench with a reaction member which abuts against a neighboring object, for example a neighboring nut, bolt and the like so as to take up the reaction foce. The reaction members are known in a variety of constructions. It is known for example from the U.S. Patent 3,868,872 to use a washer which is locked between a nut or bolt head and a flange and therefore used to absorb the reaction force. The disadvantage of this construction is that a user has to rely on a good surface contact by the washer to obtain the required friction. If the flange for example is not even, the system proposed in this patent does not work. Also, the torsional forces applied to the bolt remain the same as during the use of a standard torque wrench that reacts on an adjacent nut. It also does not stop the bolt from turning through in the same direction as the nut.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a torque wrench which avoids the disadvantages of the prior art.

In keeping with these objects and with others which will become apparent hereinafter, one feature of the present invention resides, briefly stated, in a torque wrench which comprises a power means, means actuated by the power means and having first engaging means arranged to engage and to act on one part of a threaded connector and second engaging means arranged to engage and to act on another part of the threaded connector, so that during turning of one part of a threaded connector by the first engaging means the second engaging means cooperate with the other part of the threaded connector.

In accordance with additional advantageous features of the present invention, the second engaging means can absorb a reaction force created in the other part of the threaded connector during turning of the one part, or even turn the other part in a direction which is opposite to the direction of turning of the one part of the threaded connector.

When the torque wrench is designed in accordance with the present invention, it has a simple construction and at the same time a reaction force created during turning of one part of a threaded connector is reliably absorbed by the other part of the threaded connector without creating side loads or bending forces on the other part of the threaded connector. For example, if the torque wrench is used for tightening of a nut arranged on a bolt, the reaction force created during tightening of the nut is taken up by the bolt, or the bolt can be turned in opposite direction.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front view of a torque wrench in accordance with the present invention;

FIG. 2 is a side view of the torque wrench of FIG. 1;

FIG. 3 is a view showing a side view of the torque wrench in accordance with another embodiment of the invention;

FIG. 4 is a view showing a part of the torque wrench, and particularly its power means, in accordance with a further embodiment of the invention; and

FIGS. 5-7 are views showing the torque wrench in accordance with still further embodiments of the invention.

DESCRIPTION OF THE PREFERRED EMBOIDMENTS

A torque wrench in accordance with the present invention has a housing which is identified with reference numberal 1. The torque wrench has drive means which is identified with reference numeral 2, and power means identified with reference numberal 2′ and arranged in the housing 1.

The drive means 2 in the embodiment of FIGS. 1 and 2 includes supporting plates 3 each having an opening and arranged so that a ratchet wheel 4 is turnably supported in the opening of the supporting plates 3. It is to be understood that only one supporting plate can also be provided in the wrench. The supporting plates are connected with the housing 1 by pins 5. More particularly, they are connected to additional plates 6 which are fixedly connected with the housing, for example by welding. The drive means further includes a driving link 7 which is turnable about an axle 8. The driving link 7 carries a pawl 9. The pawl 9 is engaged with the ratchet wheel 4 in a known fashion, for example by interengagement of their respective teeth or other formations.

The power means 2′ includes two fluid-operated single-acting cylinder-piston units located at opposite sides of the driving lever 7 so as to cooperate with its portion provided above the piston axle 8. Each cylinder-piston unit has a cylinder 10 formed by a part of the housing 1, and a piston 11 receiprocatingly movable in the cylinder 10.

During tightening or loosening a threaded connector, a reaction force is produced which tends to move the wrench in an opposite direction. For counteracting or taking up this reaction force, the torque wrench in accordance with the present invention is provided with a reaction member 15. The reaction member is an elongated member which is firmly connected with the housing 1 on its one end, for example by the pins 5 which connect the supporting plate 3 with the housing. In the shown embodiment, the torque wrench is used for tightening or loosening the nut 13 which is arranged on the bolt 14.

The torque wrench in accordance with the present invention is provided with two engaging means for engaging respective parts of a threaded connector. First engaging means is formed by an engaging opening 4′ which is provided in the ratchet 4 and in which for example a nut 13 arranged on a bolt 14 can be received. Second engaging means is formed by a free end of the reaction member 15 which is located near a part of the threaded connector which is turnably connected with the part to be tightened or loosened,. In the shown embodiment, the free end of the reaction member 15 is located near the head of the bolt 14.

For tightening or loosening a threaded connector, the torque wrench or more particularly the ratchet 4 is fitted with its engaging opening 4′ on the nut 13 which is arranged on the bolt 14. The free end of the reaction member 15 is then placed near the head of the bolt 14. When one of the cylinder-piston units of the power means is actuated, it turns the driving lever 7 together with the pawl 9 in one direction, whereby the pawl 9 turns the ratchet 4 in the same one direction, so that the ratchet turns the nut for its tightening. The free end of the reaction member 15 firmly engages the head of the bolt 14 and therefore the bolt 14 takes up a reaction force which is closed during turning of the nut 13. This eliminates all side loads and torsional forces which are normally applied to the bolts with tools that react distant from the member to be tightened or loosened. When then the cylinder-piston unit is actuated, it turns the driving lever 7 in an opposite direction, whereby the pawl 9 jumps over the ratchet without turning the same in an opposite direction. The same operation is repeated many times for complete tightening or loosening of the nut.

The free end of the reaction member 15 which cooperates with the bolt 14 can be formed as a flat part which plainly abuts against the bolt. On the other hand, it can be provided with an opening through which the head of the bolt 14 extends. It is to be understood that it can also be provided with other formations cooperating with the bolt.

FIG. 3 shows a torque wrench in accordance with a somewhat different embodiment of the invention. In this embodiment no additional reaction member is needed. The second engaging means is provided in one of the plates, namely the plate 3′ which is formed to cooperate with a part of the threaded connector, which is turnably connected with a part to be tightened or loosened. In the shown embodiment, the supporting plate 3′ has a free end which plainly abuts against the head of the bolt 14 or has an opening through which the head of the bolt 14 extends. The shape of the opening in the supporting plate 3′ can exactly correspond to the shape of the head of the bolt 14, for example can be hexagonal, square, splined, etc. The same is true with respect to the opening provided in the free end of the reaction member 15 in the embodiment of FIG. 2.

The embodiment of FIG. 3 eliminates the reaction member and decreases the overall height of the driving link. In addition, the torque wrench in accordance with this embodiment is self-contained unit.

It is also to be understood that when it is necessary to abut against a stationary object which is located very far from the axis of a threaded connector to be tightened or loosened, another reaction member can be mounted on the torque wrench to abut against such distant stationary object.

FIG. 4 shows power means 2″ which is formed in accordance with a further embodiment. While the fluid-power means 2′ in the embodiment of FIG. 1 includes two single-acting fluid-operated cylinder-piston units, the power means 2 ″ of FIG. 4 has only one fluid-operated cylinder-piston unit. This cylinder-piston unit is double-acting and has a cylinder 16 and a piston 17 reciprocatedly movable in the cylinder. During displacement of the piston 17 in opposite directions, it displaces the driving link 7 through an engaging element 18 in respective two directions.

On the other hand, the power means of the inventive torque wrench can be provided with only one single-acting cylinder-piston unitwhich has a spring return. In this construction the cylinder-piston unit displaces the driving link 7 in one direction to perform positive tightening or loosening, and then the spring unit moves the driving link in an opposite direction.

FIG. 5 shows a further embodiment of the present invention. The torque wrench has power means 20. The tool further has two drive means 21 and 22 connected with the power means. The drive means are provided with engaging means 23 and 24 formed for example as engaging openings which are arranged to engage a nut and a bolt head of a threaded connector respectively. Both drive means can be provided with ratchet mechanisms. It is also possible that only one of the driving means is provided with the ratchet mechanism, or both driving means do not have ratchets at all. In the latter case the tool would have to be reset after each stroke. In this construction when one part of the threaded connector is turned by the engaging means of one driving means, the engaging means of the other driving means hold the other part of the threaded connector, or even turn it in an opposite direction.

FIG. 6 shows a further modification of the embodiment of FIG. 5. In the construction shown in this Figure the second drive means 22′ is removable mounted for example on a part 25 connected with the power means 20, by pins 26. The second drive means 22′ can therefore be arranged at any side of the first driving means 21 for applying as well as releasing a bolt load.

FIG. 7 shows still a further embodiment of the inventive torque wrench. The tool has power means 30 which can be formed as a pneumatic, a hydraulic or an electric motor. Drive means 31 includes a housing with a not shown gear transmission in it. The drive means 31 is connected with engaging members 32 and 33 each having a polygonal shape. The housing of the drive means 31 is fixedly connected with the engaging member 32, while the not shown gear transmission is fixedly connected with the engaging member 33. Reference numerals 34 and 35 identify two sockets which have polygonal inner openings. The socket 34 with the engaging member 33 form first engaging means, while the socket 35 with the engaging member 32 form second engaging means. The inner shape of the socket 34 is such that it corresponds to the outer shape of the engaging member 33 and a bolt head 36. The inner shape of the socket 35 is such that it corresponds to the outer shape of the engaging member 32 and a nut 37.

When the socket 34 connects the engaging member 33 with the bolt head 36, and the socket 35 connects the engaging member 32 with the nut 37, the actuation of the power means 30 results in turning of the bolt head 36 while the nut 37 remains stationary, or turning of the nut 37 while the bolt head 33 remains stationary, or turning of the nut 37 and the bolt head 36 in opposite directions.

It is also possible in this embodiment that the bolt head and the nut can be turned without the motor, but instead by applying a manual force through a multiplier. On the other hand, the tool can be made without the drive unit 31, but instead with direct connection of the motor 30 with engaging members which directly engage the nut and the bolt head. If the nut is turned and the bolt unit remains stationary, the reaction force is actually doing the turning, and in this case the entire unit turns.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of constructions differing from the types described above.

While the invention has been illustrated and described as embodied in a torque wrench, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

Claims

1. A torque tool for tightening and loosening a threaded connector having at least first and second threaded parts turnably connected with one another, the torque tool comprising

power means;
first engaging means arranged to engage the first part of a threaded connector.
second engaging means arranged to engage the second part of a threaded connector, said engaging means being formed so that when power is applied by said power means, one of said engaging means turns one part of a threaded connector, while the other of said engaging means cooperates with the other part of a threaded connector, thus permitting tightening or loosening a threaded connector.

2. A torque wrench as defined in claim 1, wherein said second engaging means is formed so that during turning of the one part of the threaded connector by said first engaging means, the other part of the threaded connector absorbs the reaction force which is created by turning of the one part of the threaded connector.

3. A torque wrench as defined in claim 1, wherein said second engaging means is formed so that during turning of the part of the threaded connector in one direction, said second engaging means turn the other part of the threaded connector in another direction which is opposite to the one direction.

4. A torque wrench as defined in claim 1; and further comprising a housing; said second engaging means being formed as a part of said housing.

5. A torque wrench as defined in claim 1; and further comprising a housing, said second engaging means being connected with said housing.

6. A torque wrench as defined in claim 1; and further comprising drive means which transfer power from said power means to said engaging means, said drive means including a supporting plate, a ratchet turnably supported by the supporting plate and having an engaging formation which forms said first engaging means, and a driving link driven by said power means and arranged to turn said ratchet, said second engaging means being formed in said supporting plate.

7. A torque wrench as defined in claim 1; and futher comprising drive means which transfer power from said power means to said engaging means, said drive means including a supporting plate, a ratchet turnably supported by the supporting plate and having an engaging formation which forms said first engaging means, and a driving link driven by said power means and arranged to turn said ratchet; and a reaction member connected with said housing and provided with said second engaging means.

8. A torque wrench as defined in claim 1; and further comprising drive means arranged to transmit power from said power means to said engaging means, said drive means having two driving elements each connected with said engaging means.

9. A torque wrench as defined in claim 8, wherein each of said drive means is provided with a pawl-ratchet mechanism with a respective one of said engaging means.

10. A torque wrench as defined in claim 8, wherein one of said driving means is provided with a pawl-ratchet mechanism with one of said engaging means.

11. A torque wrench as defined in claim 1, wherein said power means includes a motor having an axis, said both engaging means being coaxial with said motor.

12.A torque wrench as defined in claim 11, wherein said motor of said power means is an electric motor.

13. A torque wrench as defined in claim 11; and further comprising drive means including a housing and a transmission provided in said housing and driven by said motor, said housing being connected with one of said engaging means, while said transmission is connected with the other of said engaging means.

14. A torque wrench as defined in claim 1, wherein said power means has a first axis, said first engaging means having a second axis which is spaced from said first axis in a predetermined direction, said second engaging means having a third axis which is also spaced from said first axis in said predetermined direction.

15. A torque wrench as defined in claim 1, wherein said power means includes two single-acting cylinder-piston units arranged at opposite sides of said drive means and displacing the latter in two opposite directions, respectively.

16. A torque wrench as defined in claim 1, wherein said power means includes a double-acting cylinder-piston unit arranged at one side of said drive means and displacing the latter in two opposite directions.

17. A torque wrench as defined in claim 1, wherein said power means includes a single-acting cylinder-piston unit arranged at one side of said drive means for displacing said drive means in one direction and provided with a spring return for displacing said drive means in another opposite direction.

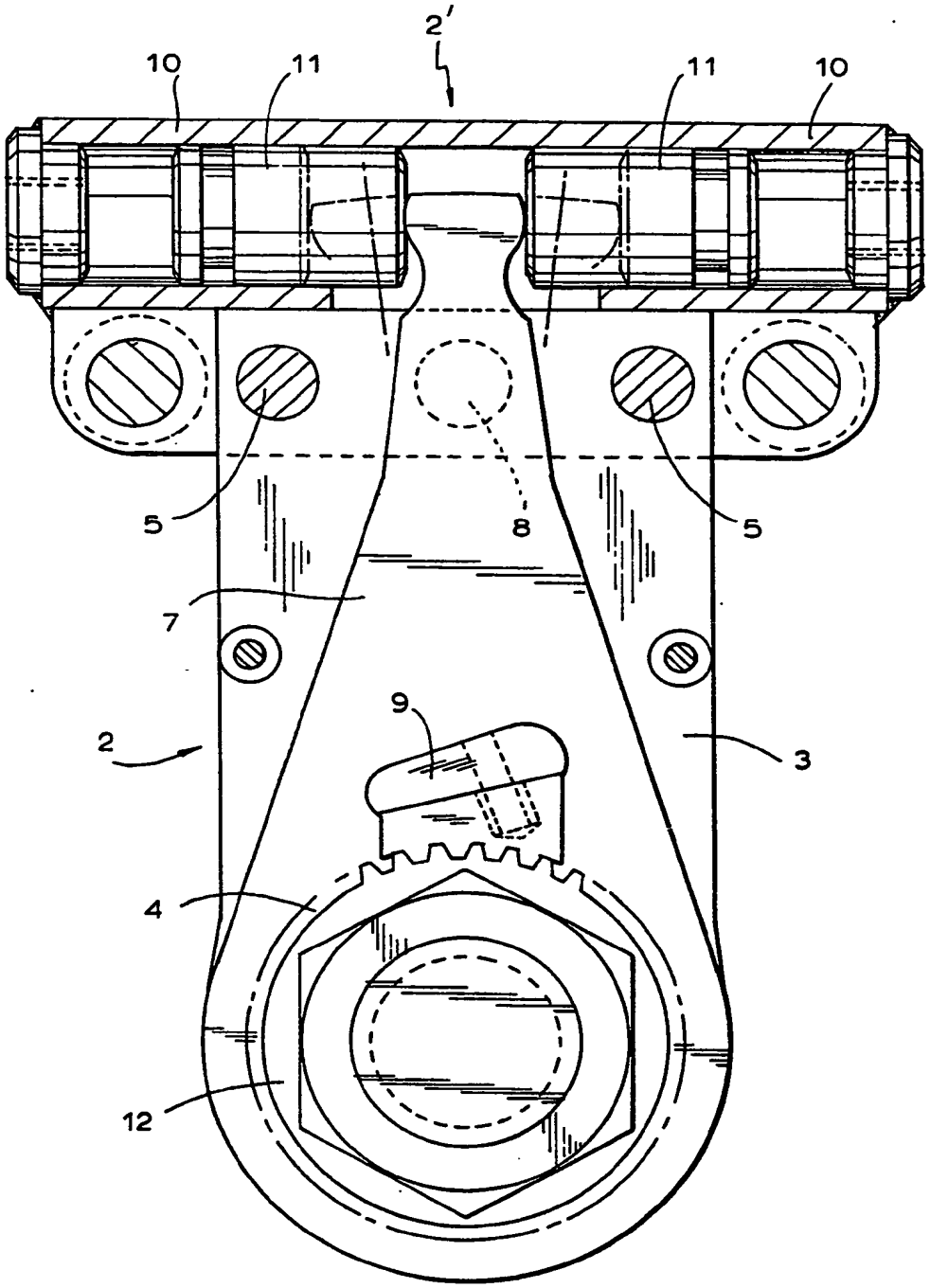

FIG. 1

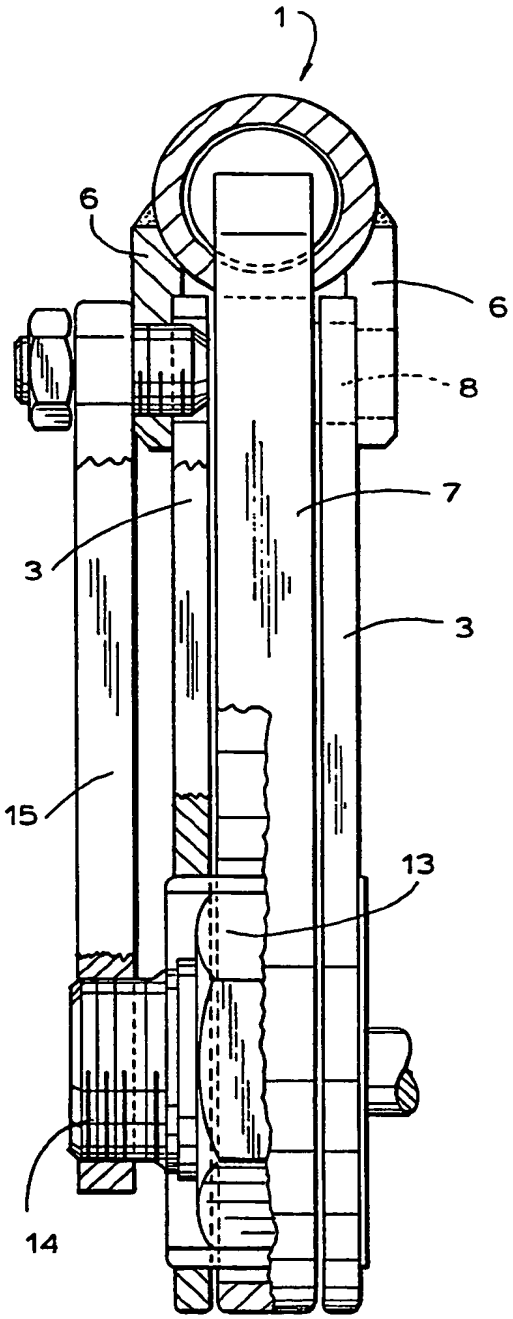

FIG. 2

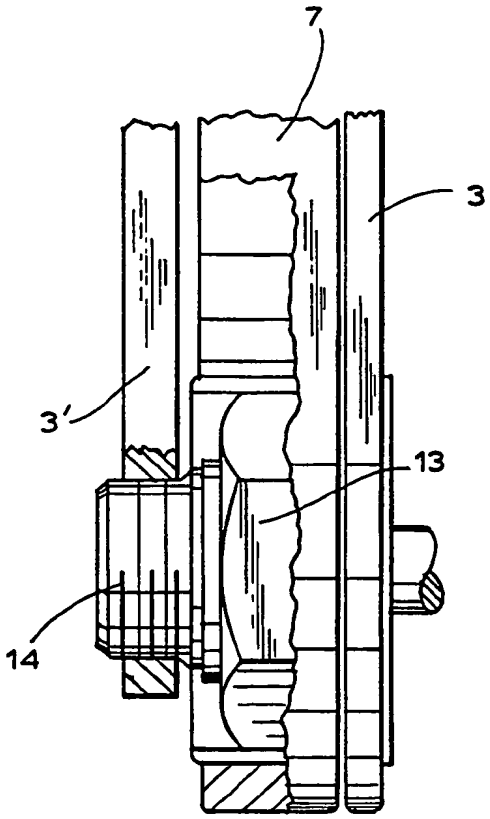

FIG. 3

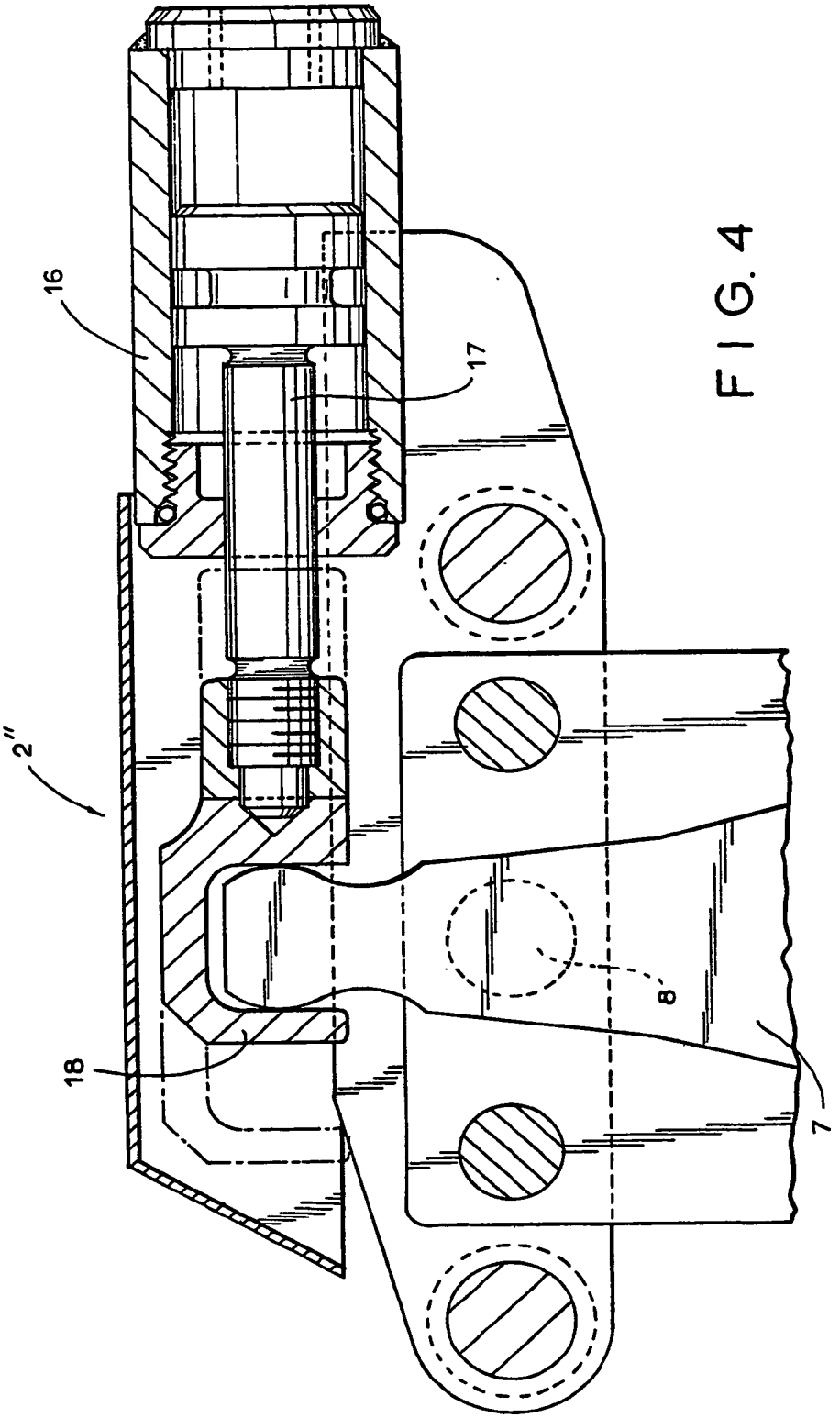

FIG. 4

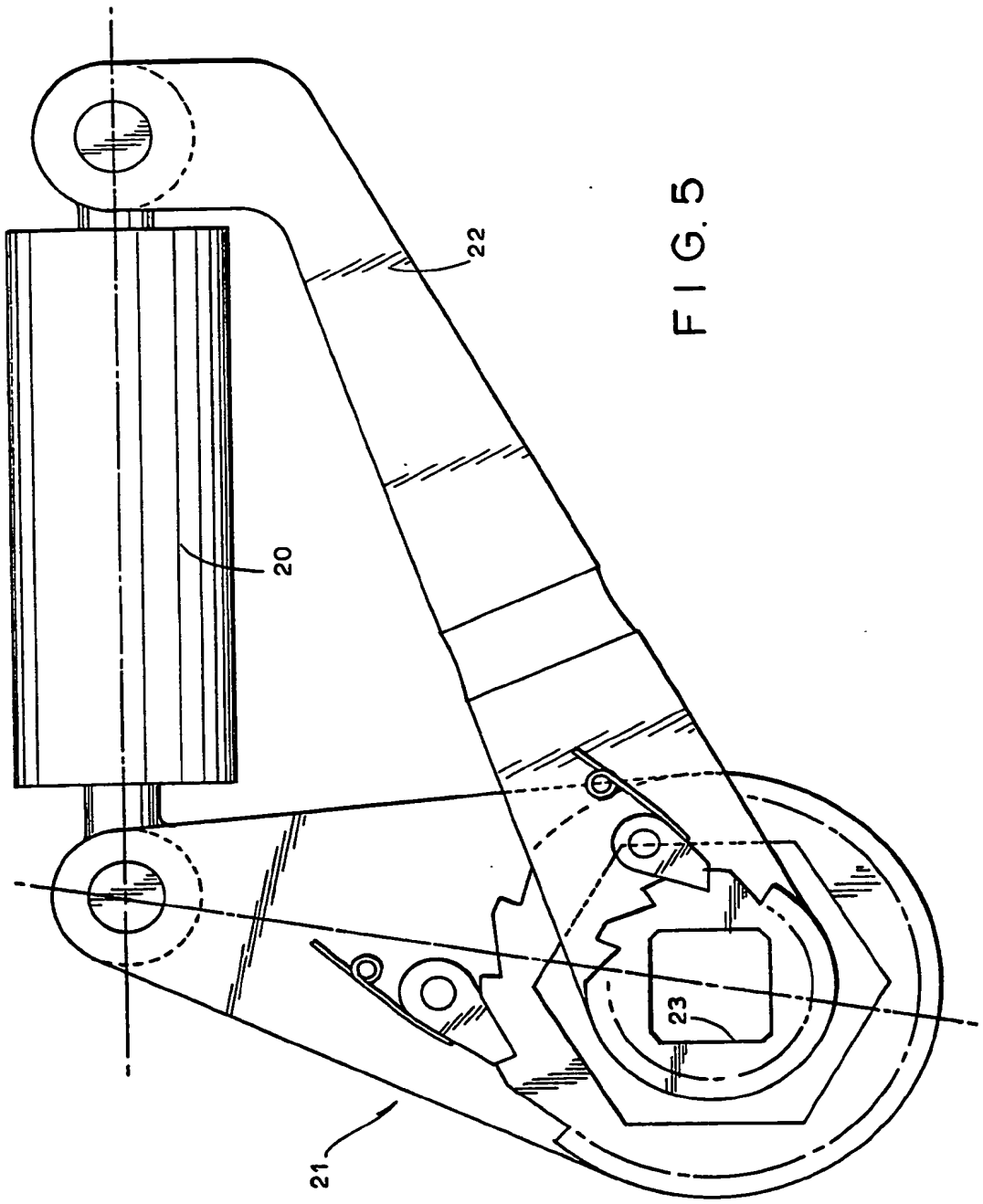

FIG. 5

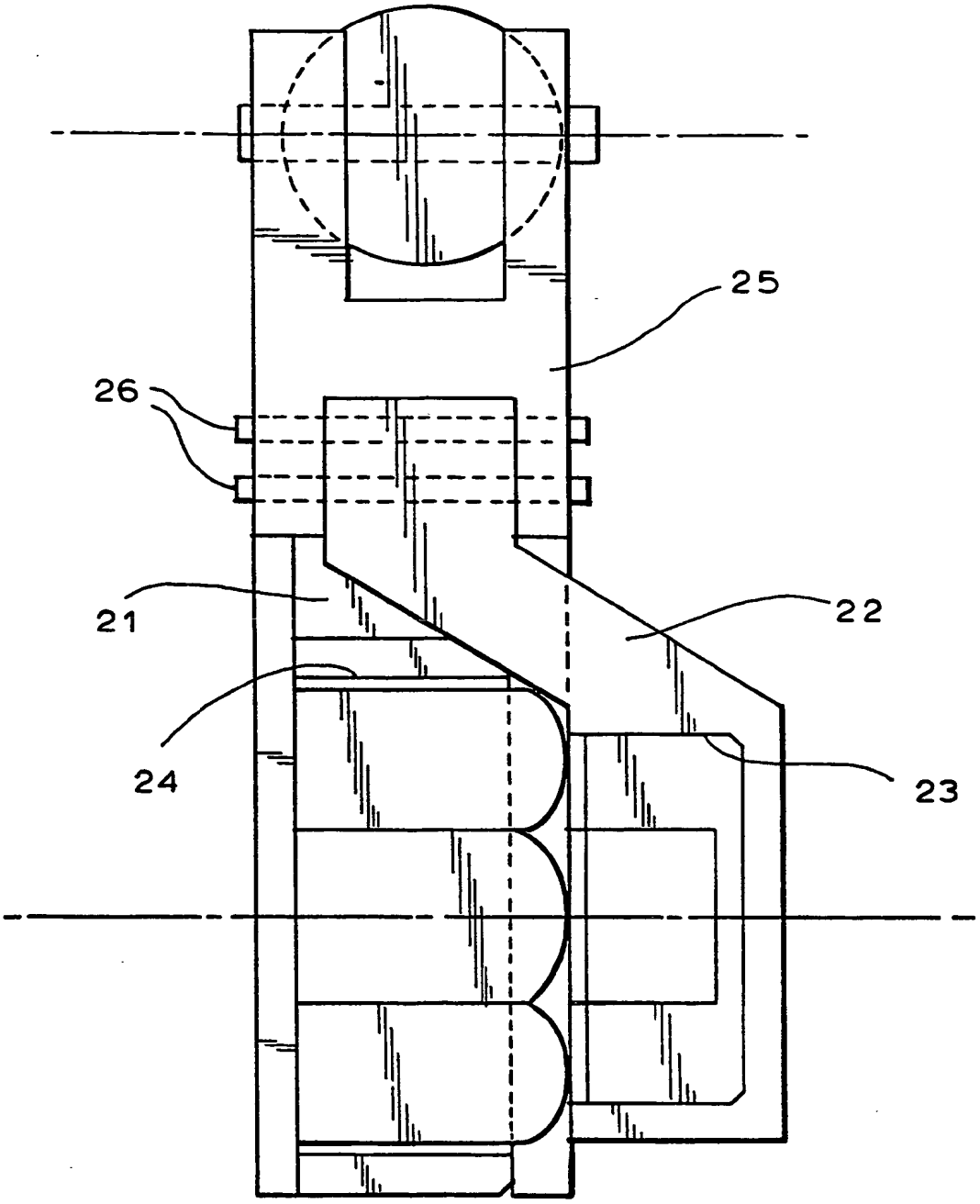

FIG. 6

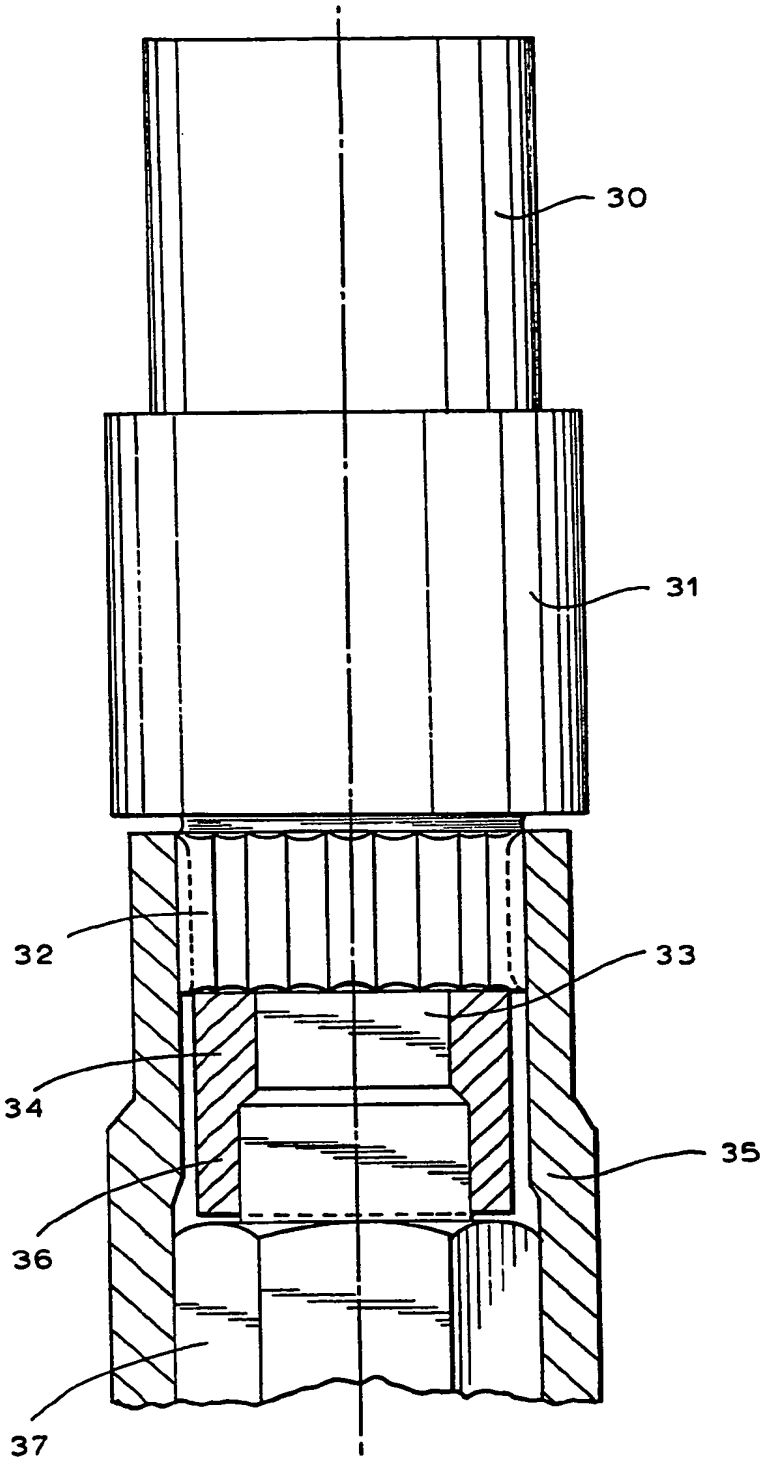

FIG. 7

European Patent Office

EUROPEAN SEARCH REPORT

Application number

DOCUMENTS CONSIDERED TO BE RELEVANT

EP 88106443.0

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	DE - A1 - 2 626 923 (MOCK GERÄTE-BAU GMBH) * Page 8, last paragraph; page 9, paragraph 1; fig. 1,2 *	1,2,3, 16	B 25 B 21/00
A	DE - A1 - 3 013 116 (WECK) * Fig. 1; page 5, last paragraph *	4,8, 11,12	
A	DE - A1 - 3 230 141 (DAIMLER-BENZ AG) * Page 5, paragraph 2; fig. 1,2 *	5,6,7, 10	
A	GB - A - 161 080 (EVENSSON) * Fig. 1 *	13	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 25 B 13/00
B 25 B 21/00
B 23 P 19/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	10-04-1989	BISTRICH

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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